CLAIMS

We claim:

1. A computer-accessible medium comprising:
a translator that is operable to receive a non-procedural image annotation template, the translator being operable to translate the non-procedural image annotation template to image annotation source code; and
a compiler operably coupled to the translator, the compiler being operable to receive the image annotation source code and to compile the source code into an image annotation executable.

2. The computer-accessible medium of claim 1, wherein the non-procedural image annotation template further comprises a mixture of XML and conventional numerical expressions based on C language syntax.

3. The computer-accessible medium of claim 1, wherein the image annotation executable further comprises an annotation presentation description.

4. The computer-accessible medium of claim 1, wherein the translator further comprises:
an iterator object for an expression tree of the non-procedural image annotation template; and
a lexical analyzer of the procedural image annotation template.

5. The computer-accessible medium of claim 1, wherein the image annotation source code further comprises an object-oriented image annotation source code and the compiler further comprises an object-oriented compiler.

6. The computer-accessible medium of claim 5, wherein the object-oriented image annotation source code further comprises Java image annotation source code and the object-oriented compiler further comprises a Java compiler.

7. The computer-accessible medium of claim 1, wherein the image annotation executable further comprises instructions that are native to the processor of a medical imaging system.

8. A computer-accessible medium having executable instructions to generate an image annotation executable from a non-procedural image annotation template to annotate images, the executable instructions capable of directing a processor to perform:

translating the non-procedural image annotation template to image annotation source code, wherein non-procedural image annotation template comprises non-procedural expression of calculations and operations to annotate an image with embedded text and wherein the procedural image annotation source code comprises procedural expression of the calculations and operations to annotate an image with embedded text; and

compiling the image annotation source code into an image annotation executable.

9. The computer-accessible medium of claim 8, wherein the compiling further comprises:

targeting the compiling to an instruction set of a processor of an imaging system.

10. The computer-accessible medium of claim 8, further comprising executable instructions capable of directing a processor to perform:

transferring the image annotation executable to an imaging system.

11. The computer-accessible medium of claim 10, wherein the imaging system is a medical imaging system.

12. The computer-accessible medium of claim 8, wherein the non-procedural image annotation template is written in a language that does not require procedural

operations and wherein the procedural image annotation source code further comprises calculations and operations to annotate an image with embedded text.

13. A development system comprising:

means for translating the non-procedural image annotation template to image annotation source code, wherein non-procedural image annotation template comprises non-procedural expression of calculations and operations to annotate an image with embedded text and wherein the procedural image annotation source code comprises procedural expression of the calculations and operations to annotate the image with the embedded text; and

means for compiling the image annotation source code into a medical image annotation executable, to an instruction set of a processor of an medical imaging system.

14. The development system of claim 13, further comprising:

means for transferring the image annotation executable to an imaging system.

15. The development system of claim 13, wherein the non-procedural image annotation template is written in a language that does not require procedural operations and wherein the procedural image annotation source code further comprises calculations and operations to annotate an image with embedded text.

16. A translator recorded on a computer-accessible medium, the translator being operable to receive a non-procedural image annotation template and to translate the non-procedural image annotation template to Java source code, the translator comprising:

a parser of the non-procedural image annotation template; and

a translator of the parsed non-procedural image annotation template to the Java source code.

17. The translator of claim 16, wherein the parser of the non-procedural image annotation template further comprises:

an initiator of a parser of the non-procedural image annotation template, the parser being compliant with the Simple API for XML standard;

an element starter;

an element parser;

an element ender; and

an element attacher.

18. The translator of claim 16, wherein the translator of the parsed non-procedural image annotation template further comprises:

a writer of Java class package source code;

a writer of Java import statement source code;

a writer of Java class declaration source code;

a writer of Java variable declaration source code; and

a filler of hash table representing at least one DICOM element of the Java source code.

19. The translator of claim 18, wherein the filler of hash tables representing elements of the Java source code further comprises:

a writer of Java source code that constructs a group tree as described by the elements of the non-procedural image annotation template;

a writer of Java source code that loads assigner attributes in an ApStyle object and hashes with instances of run-time class declarations;

a writer of Java source code that loads a data structure adapted for storage of DICOM elements with all DICOM elements that are required for annotation;

a writer of Java source code that loads the data structure adapted for tool-tip data with character strings;

a writer of Java source code that initializes a layout data structure that is designed to hold annotation strings for each quadrant, line, and segment;

a writer of Java source code that invalidates all variable contents, as one would use if this object was assigned to control annotation of another image;
a writer of Java source code that generates comments that document a runtime variable updates object; and
a writer of Java source code that evaluates expressions in order of dependencies.

20. A computer-accessible medium having executable instructions to translate a non-procedural image annotation template to Java source code, the executable instructions capable of directing a processor to perform:
parsing the non-procedural image annotation template comprising
initializing a parser of the non-procedural image annotation template, the parser being compliant with the Simple API for XML standard;
starting an element of the non-procedural image annotation template;
parsing an element of the of the non-procedural image annotation template using the parser;
ending an element of the non-procedural image annotation template; and
attaching the parsed element,
repeating the starting, parsing, ending and attaching for each element of the non-procedural image annotation template, yielding a parsed non-procedural image annotation template,
the translating further comprising:
translating the parsed non-procedural image annotation template to Java source code.

21. The computer-accessible medium of claim 20, wherein the translating of the parsed non-procedural image annotation template further comprises:
writing a Java class package;
writing Java import statements;
writing Java class declarations;

writing Java variable declarations; and

filling hash tables representing DICOM elements of the Java source code.

22. The computer-accessible medium of claim 20, wherein the non-procedural image annotation template further comprises a mixture of XML and conventional numerical expressions based on C language syntax.

23. A method to translate a non-procedural image annotation template to Java source code, the translator comprising:

parsing the non-procedural image annotation template comprising

initializing a parser of the non-procedural image annotation template, the parser being compliant with the Simple API for XML standard;

starting an element of the non-procedural image annotation template;

parsing an element of the of the non-procedural image annotation template using the parser;

ending an element of the non-procedural image annotation template; and

attaching the parsed element,

repeating the starting, parsing, ending and attaching for each element of the non-procedural image annotation template, yielding a parsed non-procedural image annotation template,

the translating further comprising:

translating the parsed non-procedural image annotation template to Java source code.

24. The method of claim 23, wherein the translating of the parsed non-procedural image annotation template further comprises:

writing a Java class package;

writing Java import statements;

writing Java class declarations;

writing Java variable declarations; and

filling hash tables representing DICOM elements of the Java source code.

25. The method of claim 23, wherein the non-procedural image annotation template further comprises a mixture of XML and conventional numerical expressions based on C language syntax.

26. A Java-based system comprising:

means for parsing the non-procedural image annotation template comprising:

means for initializing a parser of the non-procedural image annotation template, the parser being compliant with the Simple API for XML standard;

means for starting an element of the non-procedural image annotation template;

means for parsing an element of the of the non-procedural image annotation template using the parser;

means for ending an element of the non-procedural image annotation template; and

means for attaching the parsed element,

means for repeating the starting, parsing, ending and attaching for each element of the non-procedural image annotation template, yielding a parsed non-procedural image annotation template,

the Java-based system further comprising means for translating comprising:

means for writing a Java class package;

means for writing Java import statements;

means for writing Java class declarations;

means for writing Java variable declarations; and

means for filling hash tables representing DICOM elements of Java source code.

27. The Java-based system of claim 26, wherein the non-procedural image annotation template further comprises a mixture of XML and conventional numerical expressions based on C language syntax.

28. A computer-accessible medium comprising:
a template repository that is operable to store one or more non-procedural image annotation templates;
a storer of the one or more non-procedural image annotation templates, operably coupled to the template repository; and
a selector of the one of the non-procedural image annotation templates, operably coupled to the template repository.

29. The computer-accessible medium of claim 28, wherein the one or more non-procedural image annotation templates further comprises a computed tomography non-procedural image annotation template.

30. The computer-accessible medium of claim 27, wherein the one or more non-procedural image annotation templates further comprises a magnetic-resonance non-procedural image annotation template.

31. A computer-accessible medium having executable instructions to generate an image annotation executable from a non-procedural image annotation template to annotate images, the executable instructions capable of directing a processor to perform:
storing the one or more non-procedural image annotation templates in a template repository, and
selecting one of the non-procedural image annotation templates in the template repository.

32. The computer-accessible medium of claim 31, wherein the one or more non-procedural image annotation templates further comprises a computed tomography non-procedural image annotation template.

33. The computer-accessible medium of claim 31, wherein the one or more non-procedural image annotation templates further comprises a magnetic-resonance non-procedural image annotation template.

34. A computer-accessible medium comprising:
an image annotation executable; and
an image viewer, operable to receive the image annotation executable, an image and an image annotation object, the image annotation object containing text, the image viewer being operable to execute instructions contained in the image annotation executable and using text from the image annotation object, and the image viewer being operable to generate an annotated image that is annotated with the text from the image annotation object.

35. The computer-accessible medium of claim 34, wherein the instructions further comprise computer instructions that are native to a processor, the processor being operably coupled through a bus to the computer-accessible medium.

36. The computer-accessible medium of claim 34, wherein the image annotation executable further comprises an image annotation executable that is compiled from a non-procedural image annotation template.

37. The computer-accessible medium of claim 34, wherein the image annotation executable further comprises an annotation presentation description.

38. The computer-accessible medium of claim 34, wherein the image annotation object further comprises the image.

39. The computer-accessible medium of claim 37, wherein the image annotation object further comprises an image annotation object that conforms to standard that defines data elements in object-oriented terms, each object having a unique tag, name, characteristics and semantics.

40. The computer-accessible medium of claim 34, wherein the image further comprises an unannotated image.

41. The computer-accessible medium of claim 34, wherein the image annotation executable further comprises:

an object to select a style class object that is appropriate for imaging of a modality; and

an instantiated style class object.

42. The computer-accessible medium of claim 41, wherein the modality is selected from a group consisting of magnetic resonance, computed tomography, X-ray, ultrasound and positron emission tomography.

43. The computer-accessible medium of claim 41, wherein the viewer further comprises:

an object to invoke one or more methods in the object that selects a style class object that is appropriate for imaging of a modality; and

an object to receive parsed annotation data and the image from the image annotation object through a host image annotation parser, and to forward the image and text to the style class object that is appropriate for imaging of a modality.

44. The computer-accessible medium of claim 43, wherein the style class object that is appropriate for imaging of a modality further comprises:

a method to forward the image and text to a host text drawer in the viewer; and

a method to forward the image and text to a graphic utilities object that is native to an operating system that is running on a processor that is operably coupled to the computer-accessible medium, whereupon the graphic utilities object is to generate the annotated image.

45. A computer-accessible medium having executable instructions to generate and view an annotated medical image, from an image annotation object and an annotation presentation description, the image annotation object having an image, the annotation presentation description having instructions that are native to a processor that is operably coupled to the computer accessible medium, the executable instructions capable of directing the processor to perform:

receiving the annotation presentation description and the image annotation object; and

invoking the native instructions contained in the annotation presentation description and using text from the image annotation object, to generate and view the annotated medical image that is annotated with the text from the image annotation object.

46. The computer-accessible medium of claim 45, wherein the annotation presentation description further comprises an annotation presentation description that is compiled from a non-procedural image annotation template.

47. The computer-accessible medium of claim 45, wherein the image annotation object further comprises an image annotation object that conforms to standard that defines data elements in object-oriented terms, each object having a unique tag, name, characteristics and semantics.

48. The computer-accessible medium of claim 45, wherein the annotation presentation description further comprises executable instructions capable of directing the processor to perform:

selecting a style class object that is appropriate for imaging of a modality; and

instantiating the selected style class object.

49. The computer-accessible medium of claim 48, wherein the modality is selected from a group consisting of magnetic resonance, computed tomography, X-ray, ultrasound and positron emission tomography.

50. The computer-accessible medium of claim 45, wherein the executable instructions further comprise executable instructions capable of directing the processor to perform:

receiving parsed annotation data and the image from the image annotation object through a host image annotation parser; and

forwarding the image and text to a graphic utilities object that is native to an operating system that is running on the processor, whereupon the graphic utilities object is to generate and view the annotated image.

51. A method to generate and view an annotated medical image, from an image annotation object having an image and an annotation presentation description, wherein the annotation presentation description further comprises an annotation presentation description that is compiled from a non-procedural image annotation template and has instructions that are native to a processor that is operably coupled to the computer accessible medium, the method comprising:

receiving the annotation presentation description and the image annotation object, the image annotation object containing text; and

invoking the native instructions contained in the annotation presentation description and using text from the image annotation object, to generate and view the annotated medical image that is annotated with the text from the image annotation object.

52. The method of claim 51, wherein the image annotation object further comprises an image annotation object that conforms to the Digital Imaging and Communications in Medicine standard.

53. The method of claim 51, further comprising:

selecting a style class object that is appropriate for imaging of a modality, wherein the modality is selected from a group consisting of magnetic resonance, computed tomography, X-ray, ultrasound and positron emission tomography; and

instantiating the selected style class object.

54. The method of claim 51, further comprising:

receiving parsed annotation data and the image from the image annotation object through a host image annotation parser; and

forwarding the image and text to a graphic utilities object that is native to an operating system that is running on the processor, whereupon the graphic utilities object is to generate the annotated image.

55. A Java-based system to generate and view an annotated medical image, from an annotation presentation description and an annotation object, wherein the annotation object conforms to the Digital Imaging and Communications in Medicine standard and has an image, wherein the annotation presentation description further comprises an annotation presentation description compiled from a non-procedural image annotation template and has instructions that are native to a processor, the system comprising:

Java-based means for receiving the annotation presentation description and the image annotation object, the image annotation object containing text; and

Java-based means for invoking the native instructions contained in the annotation presentation description and using text from the image annotation object, to generate and view the annotated medical image that is annotated with the text from the image annotation object.

56. The Java-based system of claim 55, further comprising:

Java-based means for selecting a style class object that is appropriate for imaging of a modality, wherein the modality is selected from a group consisting of magnetic resonance, computed tomography, X-ray, ultrasound and positron emission tomography;

Java-based means for instantiating the selected style class object;

Java-based means for receiving parsed annotation data and the image from the image annotation object through a host image annotation parser; and

Java-based means for forwarding the image and text to a graphic utilities object that is native to an operating system that is running on the processor, whereupon the graphic utilities object is to generate the annotated image.

57. A computer system comprising:

a processor;

a bus operably coupled to the processor and

a computer-accessible medium comprising a viewer that is operable to access computer instructions that are native to the processor, the computer instructions having been generated by a processor on another computer system, the computer-accessible medium being operably coupled to the processor through the bus.

58. The computer system of claim 57, wherein the viewer further comprises a browser and the computer instructions further comprise computer instructions encapsulated in a browser plug-in component.

59. A computed tomography imaging system comprising:

a processor;

a bus operably coupled to the processor and

a computer-accessible medium comprising a viewer that is operable to access:

objects that conform to the Digital Imaging and Communications in Medicine standard, the objects comprising an image and an annotation presentation description; and

computer instructions that are native to the processor, the computer instructions having been generated by a processor on another system, the computer-accessible medium being operably coupled to the processor through the bus.

60. The computed tomography imaging system of claim 59, wherein the viewer further comprises a browser and the computer instructions further comprise computer instructions encapsulated in a browser plug-in component.

61. The computer system of claim 59, wherein the computer instructions further comprise computer instructions encapsulated in a dynamic link library.

62. A computer-accessible medium comprising:

an encapsulation of image annotation computer instructions; and

a viewer that is operable to access the encapsulated image annotation computer instructions.

63. The computer-accessible medium of claim 62 wherein the encapsulated image annotation computer instructions further comprise arithmetic calculations and special string operations for annotation that are native to a processor that is operably coupled to the computer-accessible medium.

64. A computer-accessible medium having executable instructions to generate an annotated image, the executable instructions capable of directing a processor to perform:

invoking executable instructions that are native to the processor, the executable instructions being contained in an image annotation executable, wherein operands to the native computer instructions include text; and

generating an annotated image that is annotated with the text from the image annotation object.

65. The computer-accessible medium of claim 64, wherein the executable instructions further comprise executable instructions capable of directing the processor to perform displaying the annotated image on a visual display in a browser.

66. The computer-accessible medium of claim 65, wherein the image annotation object further comprises an object that is encoded according to a standard that defines data elements in object-oriented terms, each object having a unique tag, name, characteristics and semantics.

67. The computer-accessible medium of claim 65, wherein the original image further comprises an original unannotated medical image.

68. The computer-accessible medium of claim 65, wherein the original image further comprises an original image contained with the image annotation object.

69. The computer-accessible medium of claim 65, wherein the image annotation executable further comprises an annotation presentation description.

70. A computer-accessible medium having executable instructions to generate an annotated medical image, an image annotation object and an annotation presentation description, the executable instructions capable of directing a processor to perform:

invoking executable instructions that are native to the processor, the executable instructions being contained in the annotation presentation description, operands to the native computer instructions including text, the image annotation object being encoded according to a standard that defines data elements in object-oriented terms, the image annotation object having a unique tag, name, characteristics and semantics;

annotating an original medical image with the text from the image annotation object; and

displaying the annotated image on a visual display.

71. The computer-accessible medium of claim 70, wherein the executable instructions further comprise annotation calculations and operations.

72. The computer-accessible medium of claim 70, wherein the displaying further comprises a displaying the annotated image in a browser.

73. The computer-accessible medium of claim 70, wherein the processor further comprises a processor of a medical imaging device.

74. The computer-accessible medium of claim 70, wherein the original image further comprises an original image contained with the image annotation object.

75. An apparatus comprising:

a processor; and

an encapsulation of image annotation computer instructions, the computer instructions being native to the processor, the computer instructions being generated by a processor on another apparatus.

76. A method of updating a medical imaging system with new annotation calculations, the method comprising:

generating on a development system an image annotation executable that includes computer instructions that are native to a processor of the medical imaging system; and

forwarding the image annotation executable through the Internet to the medical imaging system.

77. The method of claim 76, wherein the image annotation executable further comprises an image annotation executable that package is a form selected from the group consisting of a browser-plugin and a dynamic link library.

78. A method of updating a medical imaging system with new annotation calculations, the method comprising:

receiving an image annotation executable that includes computer instructions of the new annotation calculations that are native to a processor of the medical imaging system; and

storing the image annotation executable in a location that is accessible to a viewer that is enable to access the image annotation executable.

79. The method of claim 78, wherein receiving further comprises:

receiving the image annotation executable from a manufacturer of the medical imaging system.

80. The method of claim 78, wherein the medical imaging system further comprises a computer tomography medical imaging system.

81. The method of claim 78, wherein the medical imaging system further comprises a magnetic imaging medical imaging system.